

**Exploring the Properties of Water:**

**What Makes Water Special?**

**30 Points Possible**

**Introduction**

Being the most common liquid on Earth, water accounts for over 70% of Earth’s surface. Water is also found in the air we breathe, the food we eat, and in every cell of every living thing. So, what is it that makes water so special? The answer is POLARITY!

Water’s chemical formula is H2O, which represents one oxygen (O) atom bound to two hydrogen (H) atoms. Oxygen, having 8 protons in its nucleus, is much stronger than the single-proton hydrogens, which causes an unequal distribution of electron sharing. The unequal sharing of electrons (-) results in a partial negative charge on the oxygen and partial positive charges on the hydrogens. Thus water molecules are *polar covalent* molecules.

During this lab you will explore the following properties of water:

**\*cohesion \*adhesion**

**\*solubility \*surface tension**

**Prelab Questions**

1. Sketch a water molecule and indicate the positive and negative charges.

2. In your own words, explain why water is a polar covalent molecule.

3. What property of water causes it to be attracted to other water molecules? Sketch what this would look like (be specific… i.e. clearly illustrate the bonds).

4. Why is water referred to as the “universal solvent”?

5. Explain why an insect is capable of walking on water but a human cannot.

**Activity A: Water and a Penny**

**Materials:** 1 **DRY** penny, pipette, a small beaker and water

**Procedure:**

1. Predict how many drops of water can fit on a penny without spilling and write your prediction on the data chart.
2. *Gently and slowly* place drops of water on the penny until they spill, counting the number of drops that actually fit on the penny. Record the actual number.

**Data Collection and Analysis:**

|  |  |
| --- | --- |
| **Water Drops** | |
| **Predicted # of drops** | **Actual # of drops** |
|  |  |

1. Name and define the property of water that allows water droplets to pile up on the penny before spilling.
2. Sketch what the penny looked like, when viewed from the side (at eye level), prior to the spilling of the water.

**Activity B: The Floating Paperclip**

**Materials:** 1 DRY paper clip, water, ice cube

**Procedure:**

1. With a *steady* hand, place a paperclip on the surface of the water in such a way that it will not sink. (Do not let your fingers touch the water)
2. After you succeed, place a piece of ice in the water and observe the results.

**Data Analysis:**

1. Is the paper clip actually floating? Explain.
2. Name and define the property of water that allows a paper clip to rest on water’s surface.
3. What did the ice do in the cup of water? Explain why this occurred.

**Activity C: You and Water**

**Materials:** 1 hand, a large beaker, water

**Procedure:**

1. Fill the large beaker with water.
2. One member of the group, dip your hand into the large beaker of water then remove your hand and observe what you see on the surface of your skin.

**Data Analysis:**

1. What did you observe on the surface of your skin?
2. Name and define the property of water that is responsible for this observation.

**Activity D: Wax Paper and Water**

**Materials:** wax paper, pipette, small beaker, water

**Procedure:**

1. Place several drops of water on a small piece of wax paper.
2. Roll the drops around the wax paper and observe what happens to the drops.

**Data Analysis:**

1. Name and define the property responsible for your observation as you rolled drops of water around on the wax paper.

**Activity E: Soap, Wax Paper and Water**

**Materials:** liquid soap, wax paper, 1 toothpick, pipette, small beaker, water

**Procedure:**

1. Place one drop of water on a small sheet of wax paper. Sketch what you see from a side view.
2. Place the tip of the toothpick into the soap and dip it into the water drop. Sketch what you see from a side view.

**Data Analysis:**

1. What effect does soap have on the water drop? Explain why you think this effect occurs.

**Activity F: Oil and Water**

Water is a polar molecule. The oxygen atom in water has a greater electronegativity, or a stronger “pull” on the electrons that it shares with the two hydrogens it is covalently bonded to. As a result, the molecule ends up having a partially negatively charged end, near the oxygen, and a partially positively charged end near the hydrogens – much like a magnet. And much like a magnet, opposite charges will attract and likes will repel, so that the slightly negatively charged oxygen of one water molecule will be attracted to the slightly positively charged hydrogen of a neighboring water molecule. This weak attraction and “sticking together” of polar molecules is called hydrogen bonding.

**Materials:** oil, water,, food coloring, 2 small beakers

**Procedure:**

1. Put 10 mL oil in one beaker and 10mL water in another clean beaker
2. Pour 5 drops of food coloring in each beaker
3. Simultaneously pour the oil and water into the same beaker and observe what happens.

**Data Analysis:**

1. Describe what happened to the food coloring (water soluble) in each beaker.
2. What did you observe happening between the oil and water? Explain why this occurred.
3. Is oil polar or nonpolar? How do you know?

**Activity G: Sugar and Water**

**Materials:** 1-2 tsp of sugar, water, 1 medium beaker

**Procedure:**

1. Add water to the beaker
2. Add the sugar to the beaker and stir.

**Data Analysis:**

1. What happens to the sugar once it is stirred into the water? Explain why this happens?

**Activity H: Water Molecule Pieces**

**Materials:** water molecule pieces, tape

**Procedure:**

1. Using the water molecules pieces and tape, show how water molecules form hydrogen bonds.

**Data Analysis:**

1. What property of water allows for the formation of hydrogen bonds?
2. Do you think it is a weak or strong bond?

**Conclusion (HONORS: 20 points possible each)**

Each group member is to **individually** write a two paragraph summary on the properties of water. Be sure to include examples from this lab as well as from the “Properties of Water” PowerPoint presentation. Refer to the book, pages 40-43 for further assistance.

Once completed, each group member needs to staple their summary to this sheet and turn it all in at the white period basket.